RISK PREDICTION CHARTS FOR LOW BIRTH WEIGHT

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Objective: *To develop intrauterine fetal growth monitoring charts for prediction of babies with low birth weight (LBW).* ***Design:*** *Prospective study.* ***Setting:*** *Antenatal clinic of a government and a private hospital.* ***Subjects:*** *Two hundred and eighty one healthy pregnant women were enrolled before 28 weeks of pregnancy.* ***Main outcome measures:*** *The uterine fundal height and abdominal girth were recorded fortnightly. Following delivery, the neonatal birth weight was correlated with these measurements.* ***Results:*** *Graphs were plotted for the mean fundal height and abdominal girth in relation to gestational age for neonatal weight categories of 2000 g, 2500 g and 3000 ± 200 g. Measurement of the fundal height and abdominal girth predicted the neonatal weight category with a sensitivity of 87.5%, specificity of 90% and positive predictive value of 77.8%.* ***Conclusions:*** *The uterine fundal height and abdominal girth, when related to the gestational age, can accurately predict the neonatal birth weight category. The charts prepared in this study can help in prediction of LBW babies and allow appropriate intervention to be undertaken in the antenatal period at grass root level.*

Key Words: *Fetal growth, Low birth weight, Uterine height.*

L̲OW birth weight (LBW)(1) is a major public health problem in developing countries including India. Various studies have indicated the prevalence rates of LBW of around 39%. It has been observed that LBW is an important risk factor associated with a high perinatal and infant mortality (2). Surviving children very often show aberrated mental and physical development. Once a baby is born with LBW, it is exposed to all the risks associated with this condition. Among all LBW babies born in India, over 80% (3) are term but intrauterine growth retarded. The need for preventive action to reduce LBW is urgent. In this context, development of a simple tool for use by paramedical workers to predict LBW during late second or early third trimester of pregnancy may offer some scope for intervention. The present study was,

therefore, designed to develop an intrauterine fetal growth monitoring chart for prediction of LBW.

Subjects and Methods

A prospective study was undertaken from January 1992 to January 1993 on apparently healthy pregnant women with known last menstrual period. Women from various socio-economic classes were enrolled during 28 weeks of gestation from Kamla Nehru Hospital catering to lower socio-economic class in Mangalwar Peth and Shintre Hospital catering to higher and middle socio-economic classes in Sadashiv Peth (Private Hospital). Detailed obstetric histories of the enrolled women were obtained by interview technique. All the abnormal pregnancies and pregnancies associated with any major illness

were excluded from the study.

A general examination, an obstetrical examination and anthropometric measurements were undertaken at the time of enrollment. All these pregnant women were followed fortnightly till delivery and the birth weight was taken on an electronic weighing machine within 24 hours of delivery.

Fundal height and abdominal girth in cm were taken by non-stretchable tape keeping it in contact with the skin of the abdominal wall. Uterine fundal height was measured as a distance between symphysis pubes and highest point of the uterine fundus. The fundus was defined by gentle pressure exerted on a plane at right angle to the abdominal wall which was marked with a ball pen and then fundal height was measured. Abdominal girth was measured as the circumference of the abdomen at the level of the umbilicus. A simple chart for use by field worker for antenatal prediction of LBW during the third trimester of pregnancy was developed using uterine anthropometric fetal growth parameters.

Results

Two hundred eighty five women were enrolled for the study. Of these four pregnancies resulted in still births which were excluded from the study. The mean birth weight was 2801.1 (SD of 384.4 g). The proportion of prematurity with gestational period of less than 37 weeks was 7.4%

Table I depicts the mean abdominal girths and fundal heights at different periods of gestation. In order to get 3 cut off points at 2000, 2500 and 3000 g, respectively, mothers giving birth to babies with these birth weights with a range of ± 200 g were identified and the values of mean abdominal girths and mean uterine heights for gestational periods between 28 to 40

weeks were plotted as linear graphs. Separate graphs were plotted for mean fundal height and abdominal girths. The gestational period was taken on X-axis and the mean fundal height or mean abdominal girths on Y-axis. This resulted into 3 curvilinear lines corresponding to mean birth weights of 3000 g top line, 2500 g middle line and 2000 g lower line *(Figs. 1 & 2* and *Table II).*

On this newly developed charts, antenatal prediction of birth weight category as normal and low birth weights were made on 43 mothers. When predictions were made by uterine height alone, 34 out of 43 (83.7%) were correct. Similarly, when used alone with abdominal girth measurements, 83.7% could be correctly predicted *(Table III).*

Six out of 9 wrong predictions could be corrected if both the growth charts of uterine height and abdominal girths were used simultaneously (predictions of LBW as per either or both was an indication of growth retardation). Thus together both the growth charts had a predictive value of 93%. The sensitivity of these charts was 87.5%, specificity was 90% and positive predictive value was 77.8%.

TABLE I-*Abdominal Girth (cm) and Uterine Height (cm) At Various Gestational Ages*

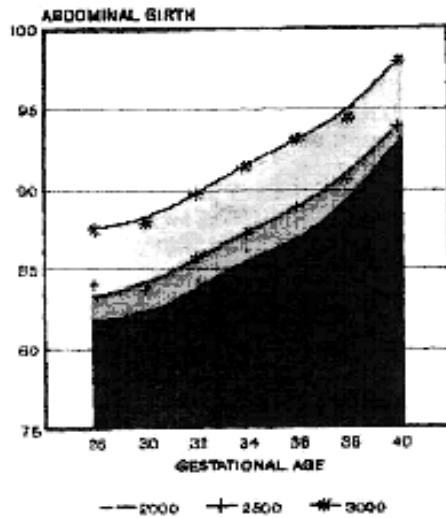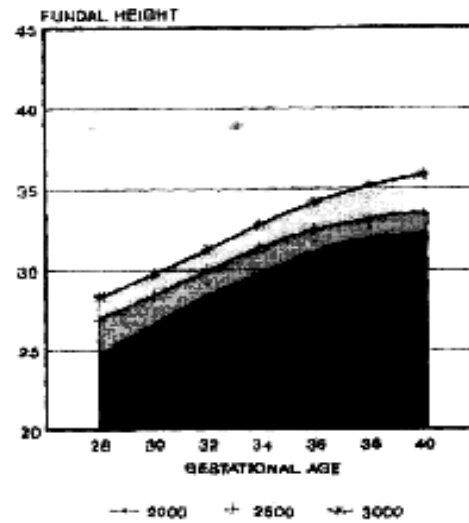| Gestational age (Weeks)	Abdominal girth (Mean ± SD)	Uterine height (Mean ± SD)
26	81.89 ± 8.6	25.38 ± 7.8
28	84.69 ± 6.4	26.89 ± 4.4
30	86.65 ±8.1	28.57 ±6.7
32	89.65 ±7.5	30.67 ± 5.1
34	91.74 ± 6.3	31.90 ± 5.6
36	90.14 ± 6.5	33.2 ± 3.7
38	91.64 ± 8.0	34.2 ± 5.7
40	94.19 ± 10.9	35.1 ± 8.6

Fig. 1. *Abdominal girth by gestation.*

Fig. 2. *Fundal height by gestation.*

T ABLE II-Mean Abdominal Girth (AG) and Fundal Height (FH) for Birth Weights at Different Periods of Gestation

Gestational age (weeks)	BW=2000 ± 200 g			BW =2500 ± 200 g			BW =3000 ± 200 g		
	No.	Mean AG(cm)	Mean FH(cm)	No.	Mean AG(cm)	Mean FH(cm)	No.	Mean AG(cm)	Mean FH(cm)
28	12	83.2	25.8	54	84.0	26.9	88	87.5	28.3
30	10	85.5	26.3	58	83.7	28.4	74	87.9	29.7
32	16	84.1	29.1	88	85.7	30.1	130	89.7	31.3
34	16	86.1	29.6	98	87,1	31.4	138	91.3	32.9
36	13	86.7	31.8	95	*88.8*	32.6	130	93.1	34.2
38	12	89.4	32.8	73	90.5	33.0	128	94.4	35.2
40	4	93.1	32.2	28	93.9	33.5	51	97.9	35.9

TABLE III-Predictions Using the Charts

	Using abdominal girth chart		Using uterine height chart		Total predictions
	Correct	Incorrect	Correct	Incorrect	
NBW	28	6	29	5	34
LBW	8	1	7	2	9
Total	36	7	36	7	43

NBW=Normal birth weight; LBW=Low birth weight.

Discussion

Uterine parameters of abdominal girth and uterine height have been used by various workers (4-8) for identification of risk of delivering a LBW baby. The cut off points for various gestational periods were mentioned in cm which were difficult to remember. Considering the educational level of field staff, a much needed simpler method of prediction of at risk mothers is suggested. The "Road to Normal Birth Weight Charts" prepared in this study gave 83.7% predictive value of LBW for both abdominal girth and fundal height when used alone. A combined use of both the graphs improved the predictive value to 93%.

The growth curves can be very easily incorporated in the Antenatal Cards for the mothers for monitoring of fetal growth during the third trimester of pregnancy. Early detection of high risk mothers who are likely to give birth to LBW babies has interventional implications. Measures like additional diet, rest and regular intake of iron and folic acid tablets may be propagated. Those mothers not showing improvement on the growth chart can be referred for further investigations and expert perinatal management. However, a standardization of these curves with a larger sample size is indicated before implementing them for routine use in the community.

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